# Study R3 - Project Operations and Recreation

Oroville Facilities Relicensing

FERC Project No. 2100

Presented to the Oroville Relicensing

Recreation and Socioeconomics Work Group

May 20, 2004

# Study Objective

- Determine the effects of current conditions and any proposed changes to project operations on recreation uses and recreational experiences during various activities.

# Task 1 – Research Project Operations Issues

- Research Project operations history
  - Lake Oroville elevation and temperature,
  - Diversion Pool, Forebay, Afterbay elevation and temperature
  - Feather River flow rates and temperature
- Review existing information on effects
- Ask “regular” users about effects

# Task 2 – Assess Effects of Operations on Recreation Use

- Effects on overall use levels, attendance vs. elevation since 1990
- Effects of low pool levels on:
  - Boat ramps
  - Car-top ramps
  - Boat-in camps
  - Swimming access
- Effects of water temperature on swimming
- Effects of flow rates and temp. on fishing

# Task 3 – Assess Effects of Operations on Rec. Experiences

- Visitor's attitudes and opinions about:
  - Reservoir conditions at low pool levels
  - Utility of boating facilities at low pool levels
  - Potential management and facility improvements

# Task 4 – Assess Future Operations Scenarios and Potential Effects

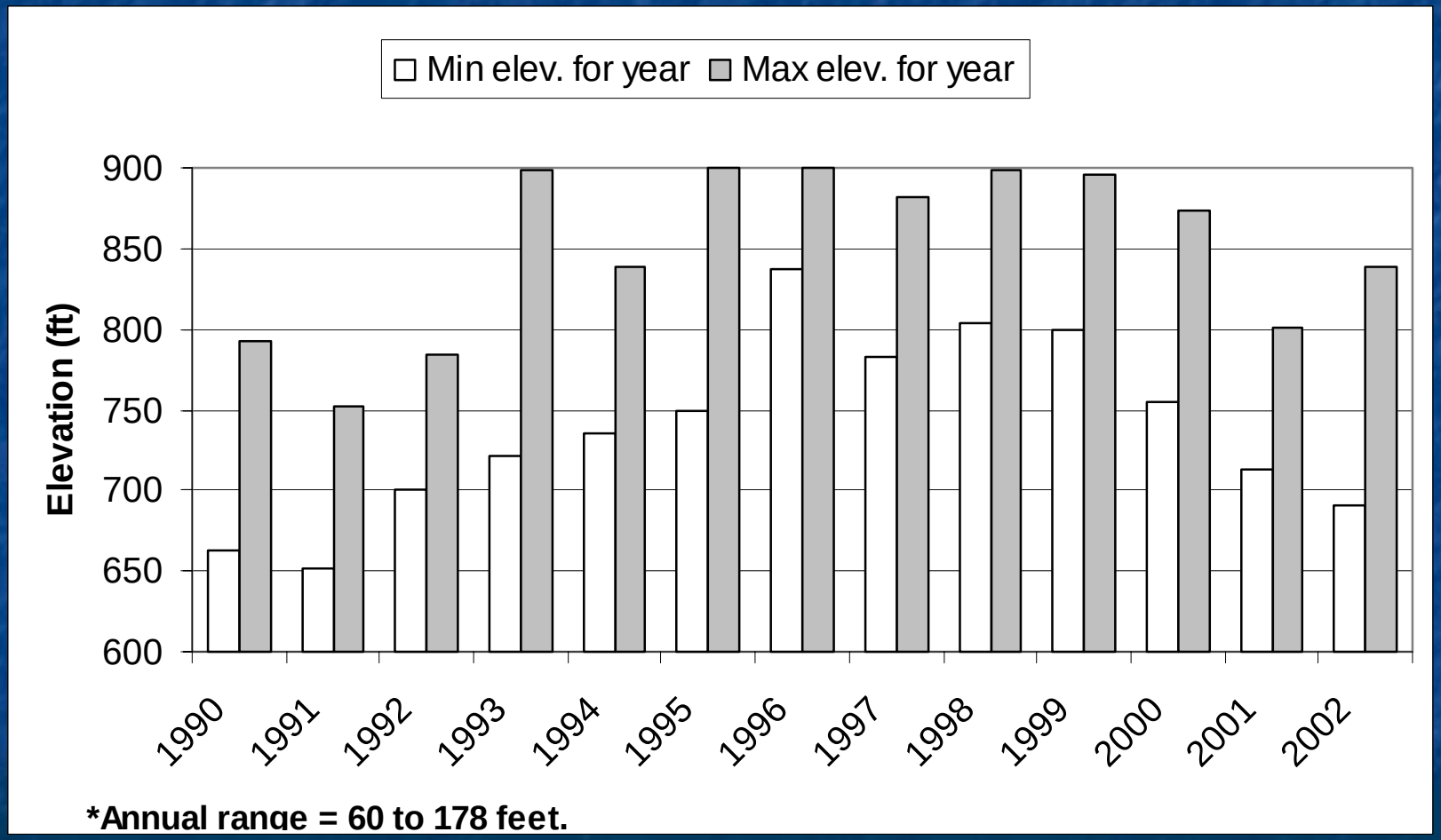
- Likely future Lake Oroville Pool levels and effects on facilities
- Likely future Feather River flows and temperature and effects on recreation
- Lake Oroville Elevation & Attendance Model (Study R-12)

# Data Sources/Methods

- Operations, Lake Level, & Temperature Data
  - CDEC website
  - SWP Operations Data monthly reports and Annual Reports of Operations
  - Water Quality Study data collected by DWR – Northern District
- Visitor Surveys
  - Recreation Visitor Survey (Study R-13)
  - Supplemental survey of “regular” users
- Observations conducted for Studies R-9 (Existing Recreation Use) and R-7 (Reservoir Boating)
- Fisheries studies conducted by Env. Work Group
- Operational Scenario Modeling conducted by E&O Workgroup

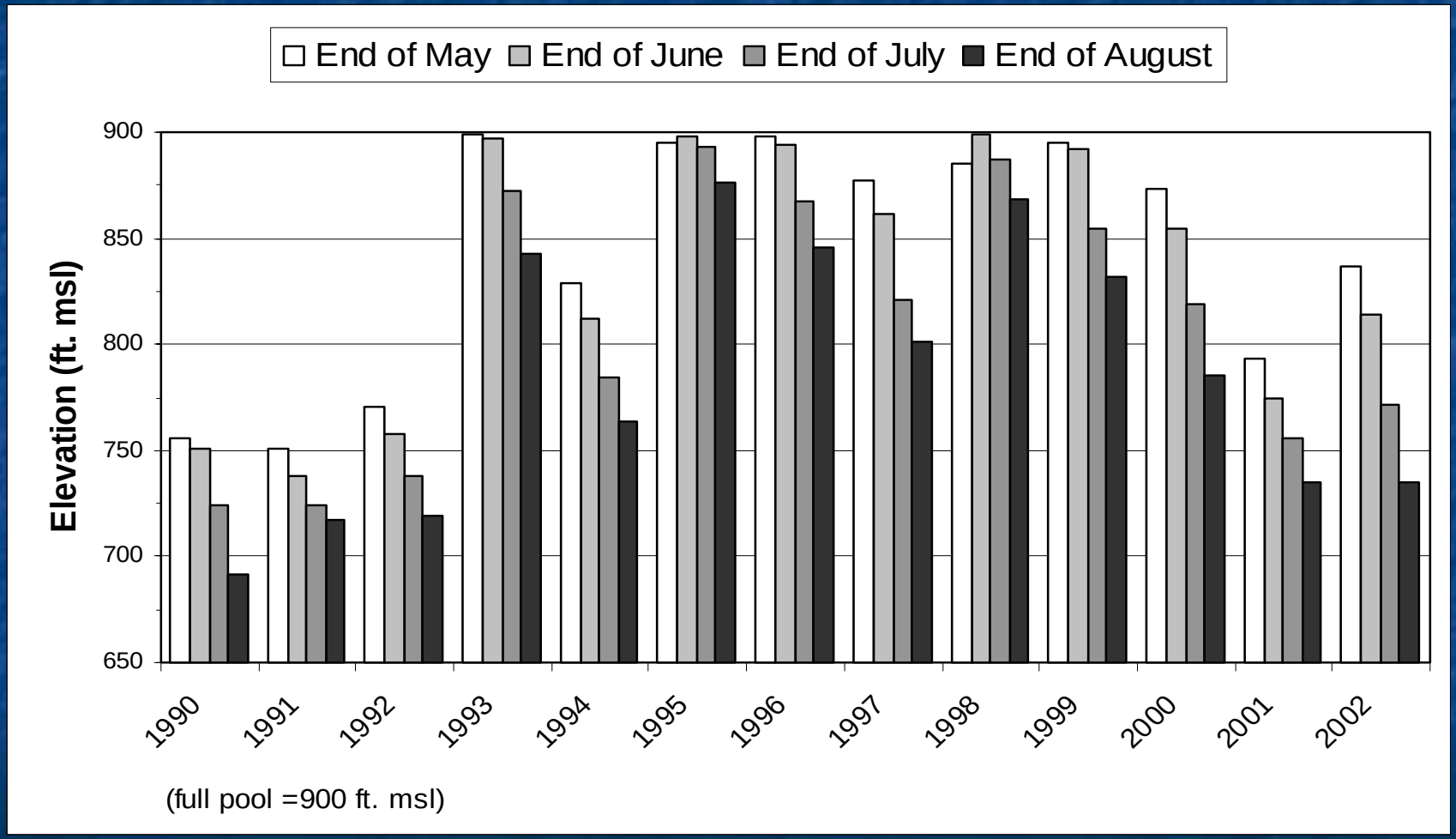
# RESULTS

# Lake Oroville Min & Max Elevation

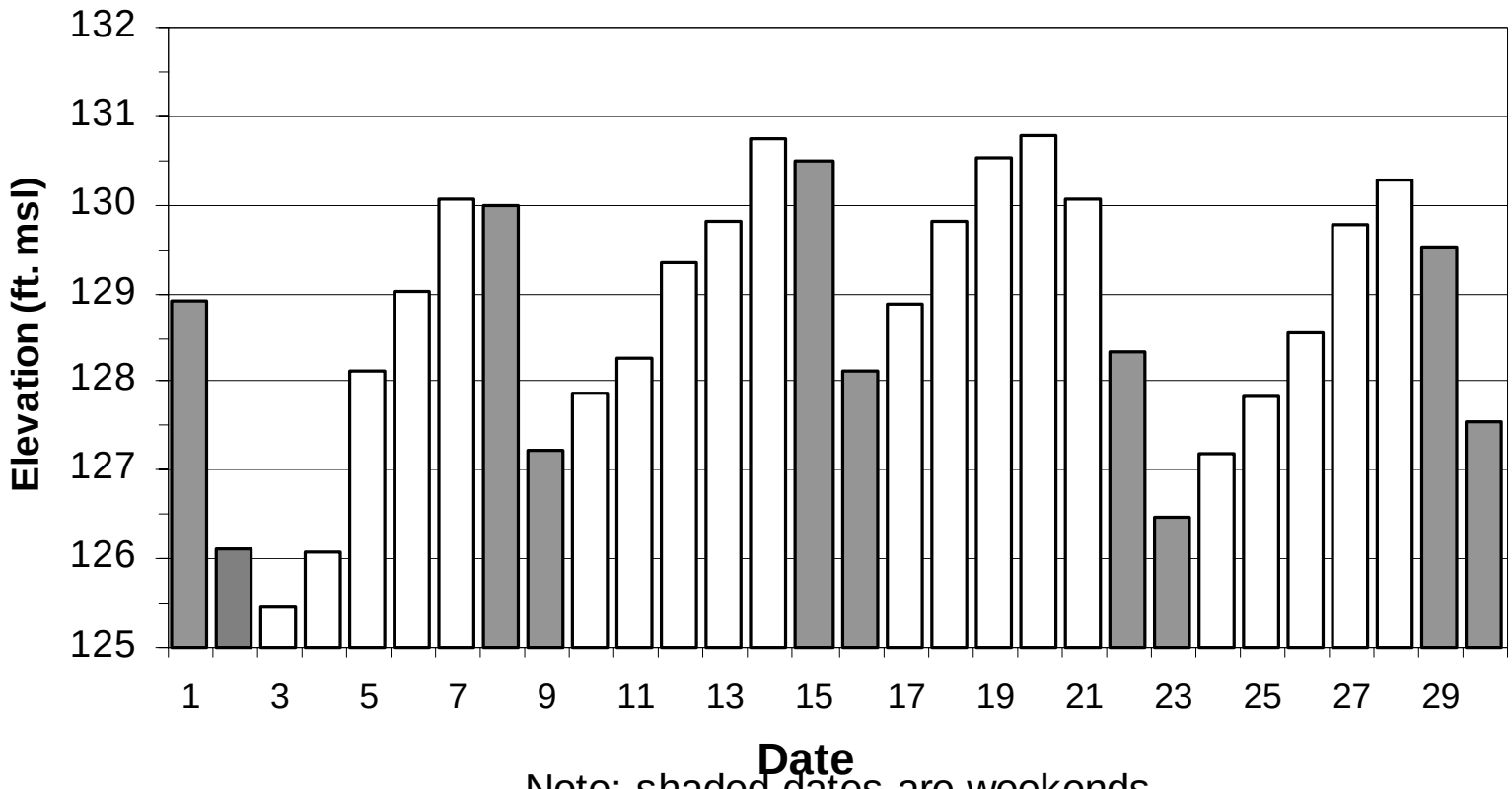



*Annual range = 60 to 178 feet.

# Lake Oroville Summer Pool Levels

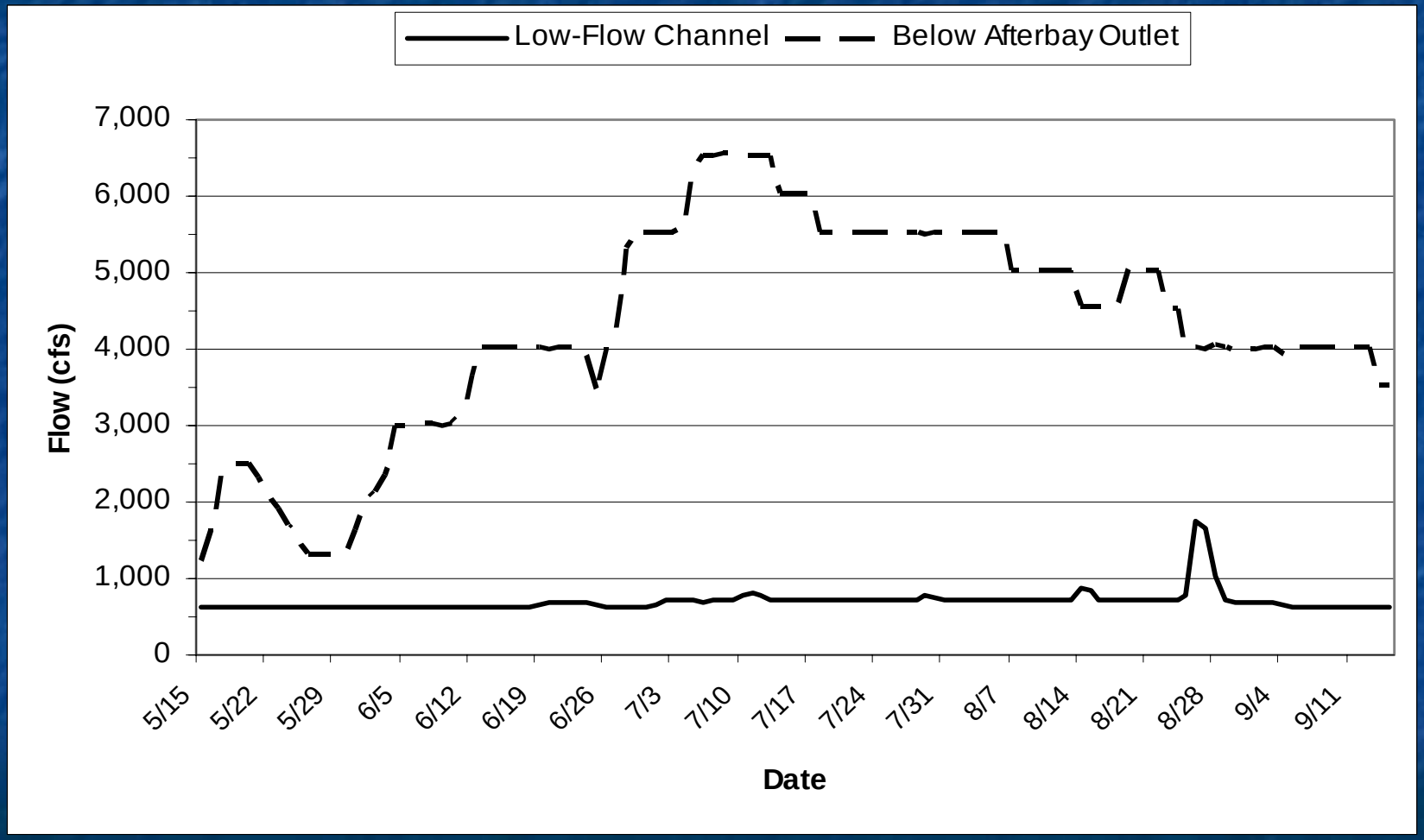


# Afterbay Pool Levels (June 2002)




Note: shaded dates are weekends

# Feather River Flow Rates



# Lake Oroville Boat Ramp Summer Closures Due to Low Water (1990-2002)

| Ramp | Minimum usable elevation | Number of days closed | Percent of days closed | No. of years closed part of season | Average no. of days closed |
|---|---|---|---|---|---|
| Lime Saddle* | 702 ft. | 32 | 2% | 1 of 13 | 32 |
| Spillway (lower)* | 695 ft. | 24 | 2% | 1 of 13 | 24 |
| Bidwell C. (lower)* | 700 ft. | 30 | 2% | 1 of 13 | 30 |
| Loafer Creek | 775 ft. | 524 | 33% | 6 of 13 | 87 |
| Enterprise | 835 ft. | 858 | 53% | 9 of 13 | 95 |

**** Hypothetical figures based on 2002 Lime Saddle, Spillway, & Bidwell extensions. Historically, Lime Saddle and Spillway had been closed 8-9 % of days, and part of the season for 3-4 of the past 13 years.***

# Lake Oroville Boat Lanes Available (Reservoir-wide)

| Pool elevation | Lanes available |
|---|---|
| 851-900 | 33 |
| 800 | 17 |
| 745 | 13 |
| 725 | 7 |
| 700* | 2 |

*** Bidwell Canyon lower ramp closes at 700 ft. elevation; Spillway lower ramp closes at 695 ft. elevation.**

# Lake Oroville Car-Top Ramp Effects

**Nelson Bar: Pool Elev. = 830 ft.**

**Foreman Creek: Pool Elev. = 830 ft.**

# Boat-in Camp Effects

**Craig Saddle BIC: Pool elev. = 837 ft.**

# Effect of Low Pool Levels on Swimming Access: Loafer Creek DUA

**June 2002, pool elev. = 832 feet**

**May 2003, pool elev. = 895 feet**

# Effects of Water Temperature on Swimming

| | |
|---|---|
| Lake Oroville | 70-80$^0$ F most of summer |
| Diversion Pool | Upper 50s F |
| Forebay | Upper 50's to low 60s F<br>Swim beach basin: first meter warms to mid-70s F |
| Afterbay | Upper 50s at north end, mid-60s near Monument Hill, upper 60s-low 70s near outlet |
| Feather River | Upper 50s at upstream end, upper 60s to low 70s at downstream end<br>Historically, warmed into 70s during summer at upstream end |

# Visitors' Perceptions of Effects of Project Operations

- About ¼ to 1/3 of visitors considered exposed land and shallow areas at low water levels and water level fluctuation to be "a big problem" during their visit.
- About half of the respondents to the supplemental survey indicated the appearance of the exposed shoreline "greatly detracted" from their visit.
- About 35% of visitors considered access to the shoreline to be a moderate or big problem during their visit.

# Boaters' Perceptions of Effects

- Low water levels were the most common reason for boaters' dissatisfaction with their visit.
- Low water may cause crowding at ramps and make launching more difficult due to mud, steepness, distance to parking.
- Perception is that boating hazards increase and areas for skiing and beaching or mooring near shore are decreased at low water levels.

# Potential Effects of Future Operational Scenarios

- Recreation Attendance Model for Lake Oroville (Study R-12):
  - Low pool levels can negatively affect attendance
  - Stated in positive terms, model estimates that 1% increase in lake level = 13K more visitors
- So...what are likely future pool levels?

# Oroville Facilities Operations Models

## CALSIM II Simulations of Lake Oroville Level as Affected by SWP Demand and Water Year Type

- Based on synthetic hydrologic data for 1922-1994 (assume full 4.2 maf Table A allotment):
  - End of May – 75% probability that all 5 developed ramps would be usable, 92% probability that all but Enterprise would be usable
  - End of August – 28% probability that all 5 developed ramps would be usable, 60% probability that all but Enterprise would be usable
- 30% reduction in water deliveries (3.0 maf) substantially increases probability of boat ramp usability late in season.

# Oroville Facilities Operations Models

- Simulation results comparing water year types:
  - Wet, Above Normal, Normal Years – all of the developed ramps except Enterprise would be usable through end of August.
  - Dry Years – Enterprise closed by end of June, Loafer Creek closed by end of August.
  - Critically Dry Years (some) – All ramps closed by end of August, but main ramps usable most of summer; in particular if successive dry/critical years.
  - Reduced deliveries in dry/critical years would result in major ramps remaining usable through August

# Oroville Facilities Operations Models:
## CALSIM II Simulation of Future Lake Oroville Water Levels

- Comparative analysis: 2002 (baseline) vs. 2020
- Uses 2020 level of development predictions
- Accounts for planned SWP and other infrastructure changes, regulatory changes, etc.
- Conclusion: reservoir levels will be similar in 2020 to past levels and, in general, are not likely to differ substantially from what has existed in past years.

# Oroville Facilities Operations Models: Simulation of Feather River Temperatures

- Simulation focused on lower river (below Afterbay outlet)
- Simulated effects of increased flow rates:
  - Used 3 flow rates (600, 1000, 4200 cfs) with temperature held constant at 65$^{o}$ F
  - Increased flow would have little effect on river temperatures within the Project area
- Simulated effects of increased outlet temps:
  - Used 4 temperatures (60, 65, 70, 75$^{o}$ F) with flow rate held constant at 1000 cfs
  - Increased temperature only 1-3$^{o}$ F above outlet temperature with typical summer conditions

# Observations and Interviews on LFC During Increased Flow Event

- Three day event (Aug 2002) increased flows from 700-800 cfs to 1000-1750 cfs
- Similar flows are proposed to benefit cold water fishery
- Only small change observed in river temp
- River users were observed and informally interviewed:
  - Increased flows attracted anglers
  - Some felt it improved, others felt it hurt fishing
  - Wading more difficult
  - Flushed weeds, debris out of Bedrock Park swimming hole
  - May also have mixed (pos and neg) effects on boating

# Conclusions

- Lake Oroville and pool levels
  - There is no “typical” year; last 10+ years have had very good, very bad, and in-between water level conditions
  - There are inevitable effects of drawdown on boating, shoreline use, aesthetics that do affect recreation use and enjoyment
  - Boating access is likely to be good most summers
  - “No access” will be a rare late fall-early winter occurrence
  - Sites like Foreman Creek and Stringtown offer boat and shoreline access at low pool levels

# Conclusions

- Diversion Pool, Forebay and Afterbay
  - Principal effect is cold water temperature
  - Most areas are colder than preferred for water-contact recreation, but substantial use of this type does occur at the Afterbay
  - Some hazards exist at Afterbay due to fluctuation
  - NFB swim basin warms nicely (at least top layer) – how to keep warm **and** deal with water quality issues?

# Conclusions

- Feather River
  - Both flow rate and cold water temperature affect recreation
  - River is substantially colder than it was pre-project during the summer
  - Fisheries issues are predominant concern on the river (2 ESA listed species) – sufficient flow and cold water are important to fishery and thus to angling and anglers

# Questions?